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efficiently.

To achieve the above-mentioned objects, according to one aspect of the present invention, an ion elution unit is constructed in the following manner. Specifically, in an ion elution unit that generates metal ions by applying a voltage between electrodes, terminals to
5 be led to outside of a casing of the ion elution unit are formed integrally to the electrodes. With this construction, as opposed to a case where different metal parts are joined together, a potential difference between the electrode and terminal is prevented, leading to prevention of corrosion. Moreover, forming them integrally helps simplify the manufacturing process.

Alternatively, according to the present invention, in an ion elution unit that
10 generates metal ions by applying a voltage between electrodes, a space between the electrodes becomes narrower from an upstream side to a downstream side along with a water current flowing thorough an inside of a casing of the ion elution unit. With this construction, as the space between the electrodes is set to be in a tapered manner, becoming narrower from the upstream side toward the downstream side. This makes the electrodes be in line with the flow
15 of water, and the electrodes are likely not generating vibration when they wear off and are thinned, and they hardly are chipped off. Moreover, there is no concern for excessive deformation of electrodes that might result in a short circuit.

Alternatively, according to the present invention, in an ion elution unit that generates metal ions by applying a voltage between electrodes, a space is made between the
20 electrodes and an inner surface of a casing of the ion elution unit. With this construction, as the electrodes are supported with a space between them and the inner surface of the casing, a growth of metal layer from the electrodes to the inner surface of the casing that might cause a short circuit between electrodes is prevented.

Alternatively, according to the present invention, in an ion elution unit that

generates metal ions by applying a voltage between electrodes, each of the electrodes has a terminal leading to an outside of a casing of the ion elution unit, and a portion of the terminal located inside the casing is protected by a sleeve made of insulating material. With this construction, the portions of the terminals located in the casing is so protected by the sleeves made of insulating material to be guarded from depletion caused by electric conduction. This helps prevent such situation as the terminals are broken in midway of their use.

Alternatively, according to the present invention, in an ion elution unit that generates metal ions by applying a voltage between electrodes, each of the electrodes has a terminal leading to an outside of a casing of the ion elution unit, and a portion where the terminal is formed is rather deep inside from an edge on an upstream side. With this construction, although the terminals are located in the upstream side of the electrodes, they are not completely at the edges, but at rather deep inside portions from the edges. Therefore, it is not necessary to be worried about a situation that depletion starting at the edge of an electrode reaches the terminal to cause a breakage of the terminal at its root.

Alternatively, according to the present invention, in an ion elution unit that generates metal ions by applying a voltage between electrodes, each of the electrodes has a terminal leading to an outside of a casing of the ion elution unit, and the terminal is located at an upstream side of the electrode in regard to a water current in the casing while an downstream side of the electrode is supported by a support formed on an inner surface of the casing. With this construction, the electrodes are supported rigidly on both upstream side and downstream side in this way, they do not vibrate although they are in the water current. As a result, the electrodes do not get broken due to vibration.

Alternatively, according to the present invention, in an ion elution unit that generates metal ions by applying a voltage between electrodes, each of the electrodes has a

terminal leading to an outside of a casing of the ion elution unit, and the terminal goes through a bottom wall of the casing to be protruded downward. With this construction, if an external surface of the casing is subjected to dew concentration caused by contact of steam with the casing or the casing being cooled down by feeding of water, the water from dew concentration flows down cables connected to the terminals and does not stay on a border between the terminals and the casing. Therefore, no situation is developed in which a short circuit occurs between the terminals due to the water caused by dew condensation.

Alternatively, according to the present invention, in an ion elution unit that generates metal ions by applying a voltage between electrodes, the ion elution unit has a casing having a water inlet and a water outlet, and a cross-sectional area of the water outlet is smaller than that of the water inlet. With this construction, being smaller in cross-sectional area than the water inlet, the water outlet has a larger resistance to flow of water than the water inlet. This makes water entering the casing through the water inlet fill an interior of the casing without causing stagnant air and soak the electrodes completely. Therefore, such situation as the electrodes have portions that are unrelated to the generation of metal ions but remain un-melted does not occur.

Alternatively, according to the present invention, in an ion elution unit that generates metal ions by applying a voltage between electrodes, the ion elution unit has a casing having an inner space a cross-sectional area of which is gradually decreasing from an upstream side to a downstream side. With this construction, not only a cross-sectional area of a water outlet is smaller than that of a water inlet but also the cross-sectional area of the inner space of the casing is gradually decreasing from the upstream side to the downstream side, generation of turbulence or air bubble inside the casing is reduced, thereby making water flow smoothly. This prevents the electrodes partially not melted by the existence of air

bubble. The metal ions come off the electrodes quickly and do not go back to the electrodes, thus increasing the efficiency of ion elution.

Alternatively, according to the present invention, in an ion elution unit that generates metal ions by applying a voltage between electrodes, the ion elution unit has a casing having a water inlet and a water outlet, and the water outlet is placed at a lowest level in an inner space of the casing. With this construction, as the water outlet is placed at the lowest level in the inner space of the casing, when feeding of water to the ion elution unit is stopped, all the water in the ion elution unit flows out through the water outlet. In consequence, no such a case occurs as water remaining in the casing is frozen when it is cold and the ion elution unit fails or breaks.

According to the present invention, in an ion elution unit as described above, an anode electrode is made of silver, copper, zinc or an alloy of silver and copper. With this construction, silver ions eluted from a silver electrode, copper ions eluted from a copper electrode and zinc ions eluted from a zinc electrode are exploited their excellent sterilizing effect, even on mold.

According to the present invention, in an ion elution unit as described above, both anode electrode and cathode electrode are made of silver, copper, zinc or an alloy of silver and copper. With this construction, silver ions eluted from a silver electrode, copper ions eluted from a copper electrode and zinc ions eluted from a zinc electrode are exploited their excellent sterilizing effect, even on mold. This effect is unchanged when the polarity of the electrodes is reversed.

According to the present invention, in an ion elution unit as described above, the polarity of the electrodes is reversed cyclically. With this construction, a problem that the surface of electrode is covered with a thick layer of scale deposited through the use of long

CLAIMS

1. An ion elution unit generating metal ions by applying a voltage between electrodes,

wherein terminals to be led to outside of a casing of the ion elution unit are formed
5 integrally to the electrodes.

2. An ion elution unit generating metal ions by applying a voltage between electrodes,

wherein a space between the electrodes becomes narrower from an upstream side to a
10 downstream side along with a water current flowing through an inside of a casing of the ion elution unit.

3. An ion elution unit generating metal ions by applying a voltage between electrodes,

15 wherein a space is made between the electrodes and an inner surface of a casing of the ion elution unit.

4. An ion elution unit generating metal ions by applying a voltage between electrodes,

20 wherein each of the electrodes has a terminal leading to an outside of a casing of the ion elution unit, and a portion of the terminal located inside the casing is protected by a sleeve made of insulating material.

5. An ion elution unit generating metal ions by applying a voltage between

electrodes,

wherein each of the electrodes has a terminal leading to an outside of a casing of the ion elution unit, and a portion where the terminal is formed is rather deep inside from an edge on an upstream side.

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6. An ion elution unit that generates metal ions by applying a voltage between electrodes,

wherein each of the electrodes has a terminal leading to an outside of a casing of the ion elution unit, and the terminal is located at an upstream side of the electrode in regard to a
10 water current in the casing while an downstream side of the electrode is supported by a support formed on an inner surface of the casing.

7. An ion elution unit that generates metal ions by applying a voltage between electrodes,

15 wherein each of the electrodes has a terminal leading to an outside of a casing of the ion elution unit, and the terminal goes through a bottom wall of the casing to be protruded downward.

8. An ion elution unit that generates metal ions by applying a voltage
20 between electrodes,

wherein the ion elution unit has a casing having a water inlet and a water outlet, and a cross-sectional area of the water outlet is smaller than that of the water inlet.

9. An ion elution unit that generates metal ions by applying a voltage between

electrodes,

wherein the ion elution unit has a casing having an inner space a cross-sectional area of which is gradually decreasing from an upstream side to a downstream side.

5 10. An ion elution unit that generates metal ions by applying a voltage between electrodes, the ion elution unit has a casing having a water inlet and a water outlet, and the water outlet is placed at a lowest level in an inner space of the casing.

10 11. The ion elution unit according to one of claims 1 through 10, wherein an anode electrode is made of silver, copper, zinc or an alloy of silver and copper.

15 12. The ion elution unit according to one of claims 1 through 10, wherein both anode electrode and cathode electrode are made of silver, copper, zinc or an alloy of silver and copper.

13. The ion elution unit according to claim 12, wherein the polarity of the electrodes is reversed cyclically.

20 14. An appliance that incorporates the ion elution unit according to claim 12 and that uses water mixed with metal ions generated by the metal ion elution unit.

15. An appliance that incorporates the ion elution unit according to claim 13 and that uses water mixed with metal ions generated by the metal ion elution unit.

16. The appliance according to claim 14, .
wherein the appliance is a washer.

17. The appliance according to claim 15,
wherein the appliance is a washer.

ABSTRACT

An ion elution unit generates metal ions by applying a voltage between electrodes.

Terminals are formed integrally to the electrodes. The terminals protrude downward through the bottom wall of the casing of the ion elution unit. The space between the electrodes

5 becomes narrower from the upstream side to the downstream side along with the water current flowing through the inside of the casing. The casing has a water inlet and a water outlet, the cross-sectional area of the water outlet is smaller than that of the water inlet. The water outlet is disposed at the lowest level in the inner space of the casing. The cross-sectional area of the inner space of the casing gradually decreases from the upstream side to the

10 downstream side.